Space Weather Technical Forecast

Issued on Saturday, 19 August 2023 at 13:21 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of isolated R1 Radio Blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity measured by GOES16 has remained Low, with the peak flare a C5.8 event from AR3406 in the far southwest at 19/0648 UTC. Background X-ray flux is at high B-class levels.

There are currently up to nine sunspot regions on the visible disc. All of the current front-sided active regions were either stable or in decay. The main changes observed include the loss of visible penumbra on the trailer spots of AR3403 (Csi/Beta) and AR3405 (Cso/Beta) as they continue their slow decline. The view of the unnumbered group (Dsi/Beta) near the southeastern limb still remains foreshortened in coronagraph imagery, however it appears bright in EUV imagery and looks to be a bipolar group with a number of fairly small spots. AR3412, a simple unipolar (Hsx/Alpha) region in the far northeast has been numbered. All other groups are small and/or simple at this time.

Two CMEs that were produced late in the UTC day on 18 August have been assessed as clear misses ahead of Earth orbit. A large filament eruption evident from around 19/0730 UTC in the far east appears to be just over the limb. As a result no Earth directed CMEs have been determined.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR and ACE at L1, suggests Earth is transiting but now slowly exiting a sector of space characterised by a negative polarity fast wind of CH35/-. The phi angle was almost exclusively negative (towards the Sun) supporting this assertion.

Solar wind speeds generally varied between 450-500km/s through much of the period, peaking at 527km/s (Elevated) at 19/0741 UTC, though this was amidst the gradual decline of the solar wind in recent hours. Current speeds are now around 430km/s (Slightly Elevated). The solar wind density largely varied between 5-10 ppcc (Average), though has declined more recently to Below Average values. The IMF initially varied between 10-12nT (Moderate), but has since moderated to become Weak from 18/1740 UTC. The north-south component was initially moderately positive (peak +11nT), though soon became Weak and not spending protracted periods either co- or anti-aligned with Earth's field.

The net result of the above solar wind measures was for Quiet to Unsettled geomagnetic activity, peaking with a Kp3 interval in the 2100-2400UTC period.

Energetic Particles / Solar Radiation: GOES16 high energy (greater than 10MeV) proton flux remained at Background levels.

GOES16 high energy (greater than 2MeV) electron flux persisted at Normal Background levels, with the associated 24-hour fluence well below the Active level, with an observed value of 1.49e6 integrated pfu at 19/0001UTC.

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Four-Day Space Weather Forecast Summary

Solar Activity: Activity is most likely to remain Low, but perhaps show an uptick in the coming days with the arrival of some far-sided groups (that were highly active as they left the Earth-facing side) into the new UTC week.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in the forecast, and the sole fast wind is the incumbent, but waning influence of CH35/-. Chances of isolated Unsettled intervals should fade later in the UTC weekend to otherwise leave a largely Quiet remainder of the forecast into the new UTC working week.

Energetic Particles / Solar Radiation: High energy (greater than 10 MeV) proton flux is expected to remain at Background levels.

High energy electron flux (greater than 2MeV) may show a slight increase as CH35/- wanes, with diurnal peaks in Moderate becoming more likely later in the UTC weekend. The associated 24-hour fluence is expected to persist comfortably below Active (1e8 integrated pfu).

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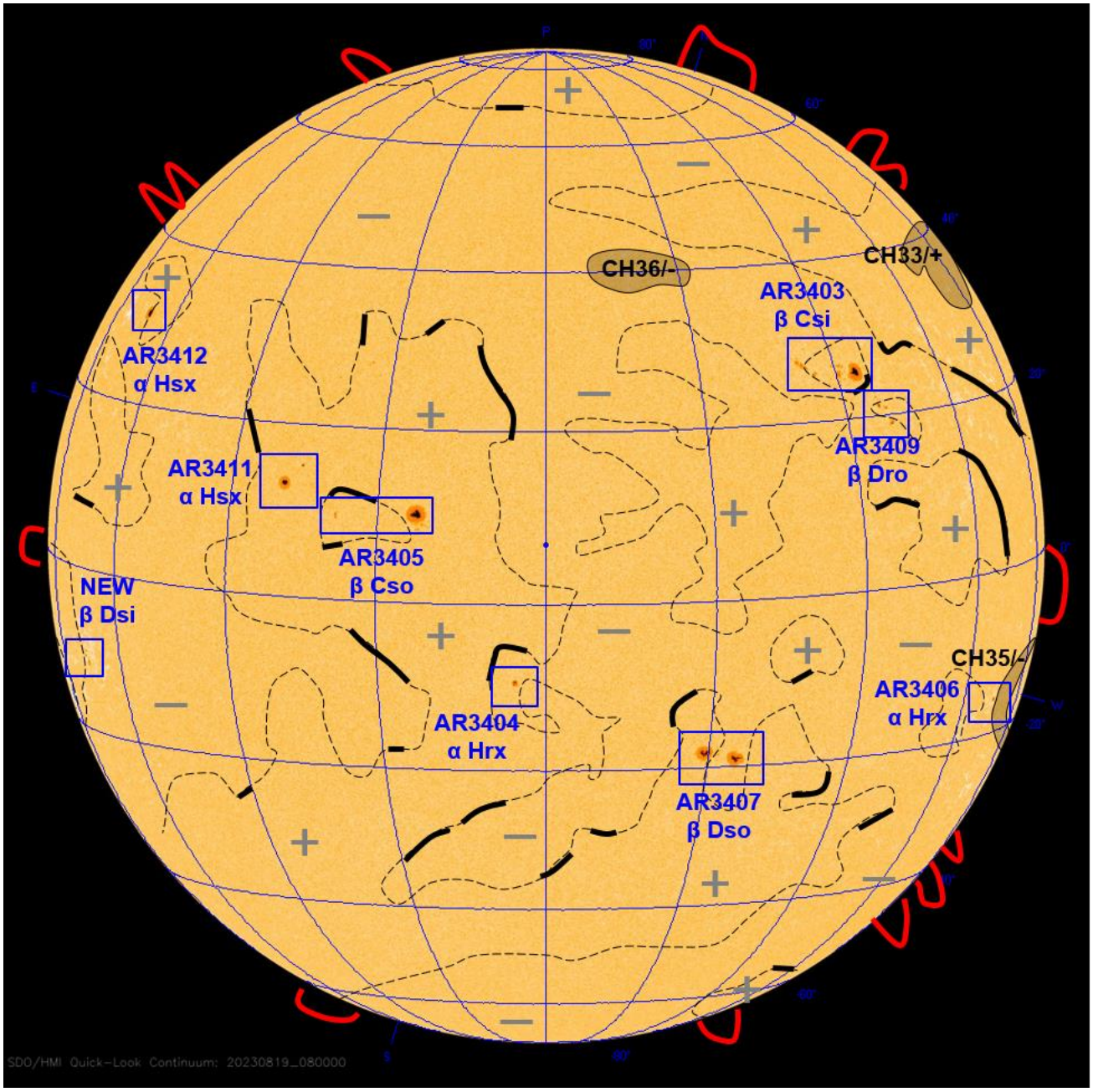
Figure 1. Solar Analysis Valid 19/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:
No Earth-directed CMEs currently feature in the forecast period.

The sole fast wind is the incumbent, but waning influence of CH35/-, with the minor coronal hole 36/- in the northwest quadrant not considered likely to significantly connect with Earth. Chances of isolated Unsettled intervals should fade later in the UTC weekend to otherwise leave a largely Quiet remainder of the forecast into the new UTC working week.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections - Nil

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Radio Blackouts - X-Ray Flares:

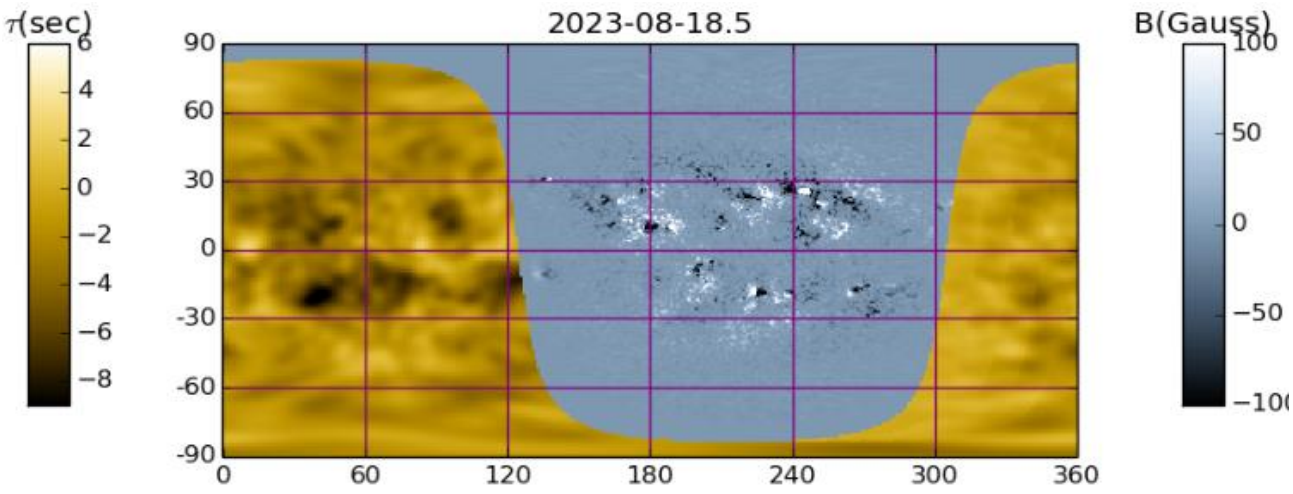
Solar activity has remained Low during the past 24 hours, with the 10.7cm flux falling to 150sfu from a midweek high of 160, although there are signs that this falling trend has now greatly slowed.

Although there are nine active regions on the visible disc at present, most of these are stable or in a state of decay. Previously more complex areas AR3403 (Csi/Beta) and AR3405 (Cso/Beta) have simplified magnetically with their trailer spots largely faded. The unnumbered region (Dsi/Beta) near the southeast limb will become easier to analyse as it rotates into clear view in the coming days but presents a fairly strong signature on EUV imagery.

The eastern solar horizon will shortly reveal the Carrington location for the previously active Ex-3386 (in the northern hemisphere) of roughly a fortnight ago, and is perhaps already showing a returning feature that may respond to Ex-3380 on the southeastern limb. While neither is guaranteed to show its former activity, given the quiet frontside, these additions are considered likely to increase the risk of M-class flares, and far-side soundings hint that they (or at least the plages they inhabit) remain in place. This should at least counteract the loss of AR3406 over the western horizon in a couple of days.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 2: Stanford Seismic Monitor of the Sun's Far Hemisphere for the Solar Dynamics Observatory. Image indicates numerous dark areas (Strong Active Regions) on the far side of the sun that may rotate over the eastern horizon in the coming days



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Solar Radiation Storms - (High Energy Protons):

High energy (greater than 10MeV) proton flux observed by GOES16 is expected to remain at Background levels.

There persists an ongoing and very gradually increasing Slight Chance of proton flux increases from any significant flares, perhaps most likely from the western solar hemisphere, however these are considered very unlikely to reach S1 Minor Solar Radiation Storm levels.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	2	2	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy (greater than 2 MeV) electron flux is at Normal Background levels. A degree of recovery in flux at GEO is expected later in the current UTC weekend as the fast wind from CH35/- wanes, however the limited strength of the current enhancement along with persistence and the latest MOSWOC REFM forecast all suggest that this will prove insufficient to generated Active 24-hour integrated fluence.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	5	10
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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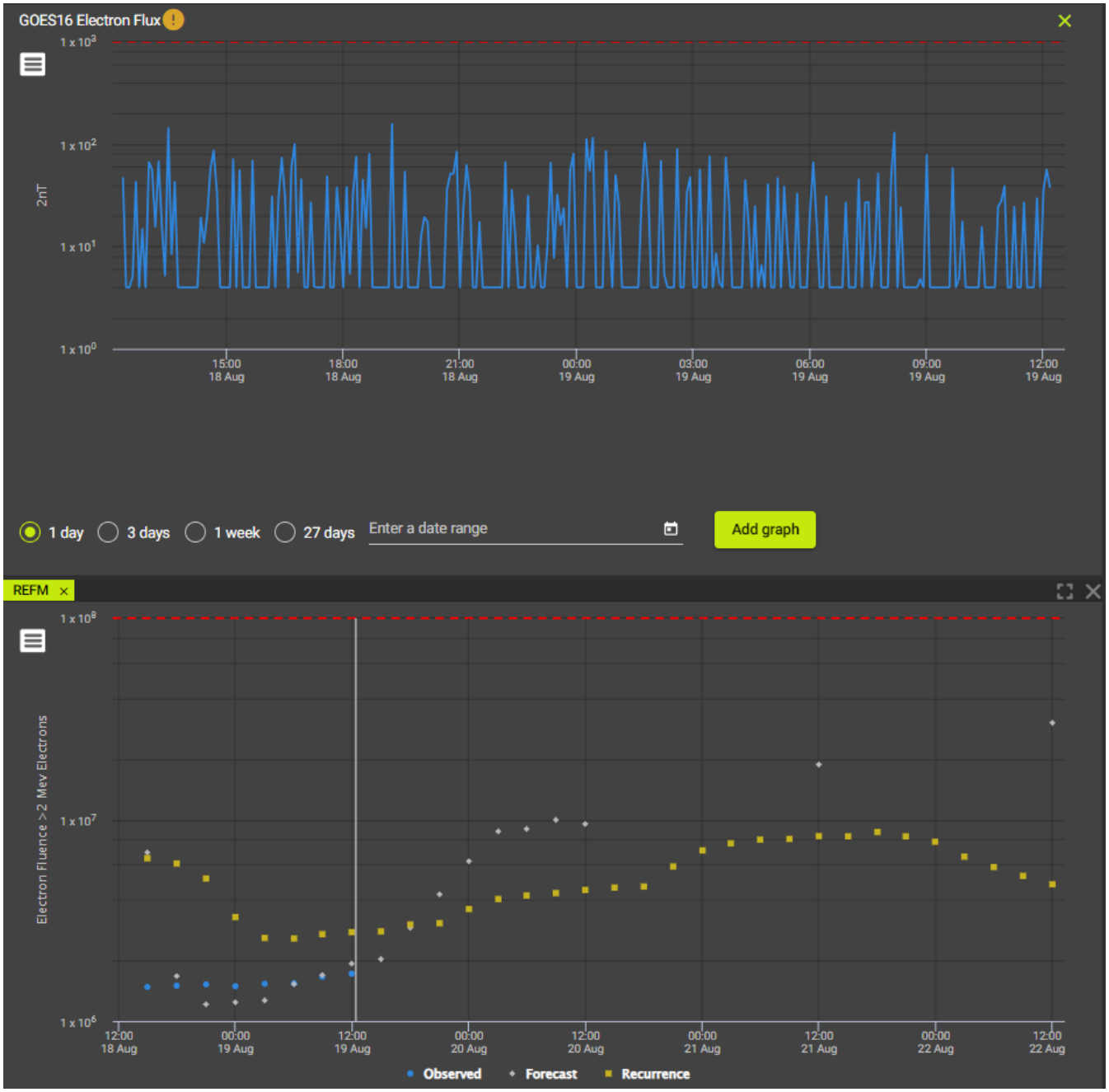
Figure 3: GOES 16 >2MeV Electron flux (top) and associated Fluence with REFM and recurrence (below)



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